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ROHR INC		
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<p>LETTER FROM ROHR INC TO USEPA REGARDING INFORMATION ON THE ENCLOSED STUDY CONCERNING THE FACILITY RELEASES UNDER THE CALIFORNIA HOT SPOTS INFORMATION AND RISK ASSESSMENTS W-ATTACH</p>		
Chemical Category		
METHYL CHLOROFORM (71-55-6)		

CONTAINS NO CBI



ROHR, INC.

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May 28, 1992



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Office of Toxic Substance
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

ATTN: 8(d) Health and Safety Reporting Rule (Notification/
Reporting)

Dear Sir or Madame:

Pursuant to TSCA Section 8(d) and 40 CFR 716, Rohr, Inc. is submitting the enclosed study on the following list of chemicals.

- o Methyl Chloroform
CAS #71-55-6
- o Methylene Chloride
CAS #75-09-2
- o Perchloroethylene
CAS #127-18-4
- o Phenol
CAS #108-95-2
- o 4,4' - Diphenylmethane Diisocyanate (aka: benzene, 1,1'-
methylenebis[4-isocyanato-], MDI)
CAS #101-68-8
- o Hexamethylene Diisocyanate Monomer (aka: hexane, 1,6-
diisocyanato-)
CAS #822-06-0
- o Monomeric Toluene Diisocyanate (aka: benzene, 1,3-
diisocyanatomethyl-, TDI)
CAS #26471-62-5

We notified EPA of the initiation of the study by letter dated April 9, 1992. This study is a risk assessment which is a part of a series of requirements for estimating and evaluating

Page 2 of 2

facility releases under the California Hot Spots Information and Assessment Act. We have serious concerns about the accuracy of the estimated risks in this study because we believe that the monitoring data on which they are based may be erroneous. Rohr may conduct additional studies.

Please note, that background information (Appendix B and C) is available upon request. Should you have any questions or need clarification, please do not hesitate to contact:

Diane K. Kenney, CIH
Manager, Corporate Safety and Health
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(619) 691- 6693

Sincerely,



R. William Difley
Vice President, Human Resources
(619) 691- 2048

attachment
enclosure
rw dkk

Attachment: TSCA Section 8(d) Studies

Section 8(d) Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Methyl Chloroform (CAS # 71-55-6).

Completion Date: May 7, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne methyl chloroform facility emissions.

Type of data collected: methyl chloroform emissions, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official: R. William Difley
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Attachment: TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Methylene Chloride (CAS # 75-09-2).

Completion Date: May 7, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne methylene chloride facility emissions.

Type of data collected: methylene chloride emissions, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Figure 1

**MAPS, CHARTS, OR GRAPHS
ARE LOCATED IN LAST FICHE
OF THIS DOCUMENT**

Figure 2. 50m receptor grids

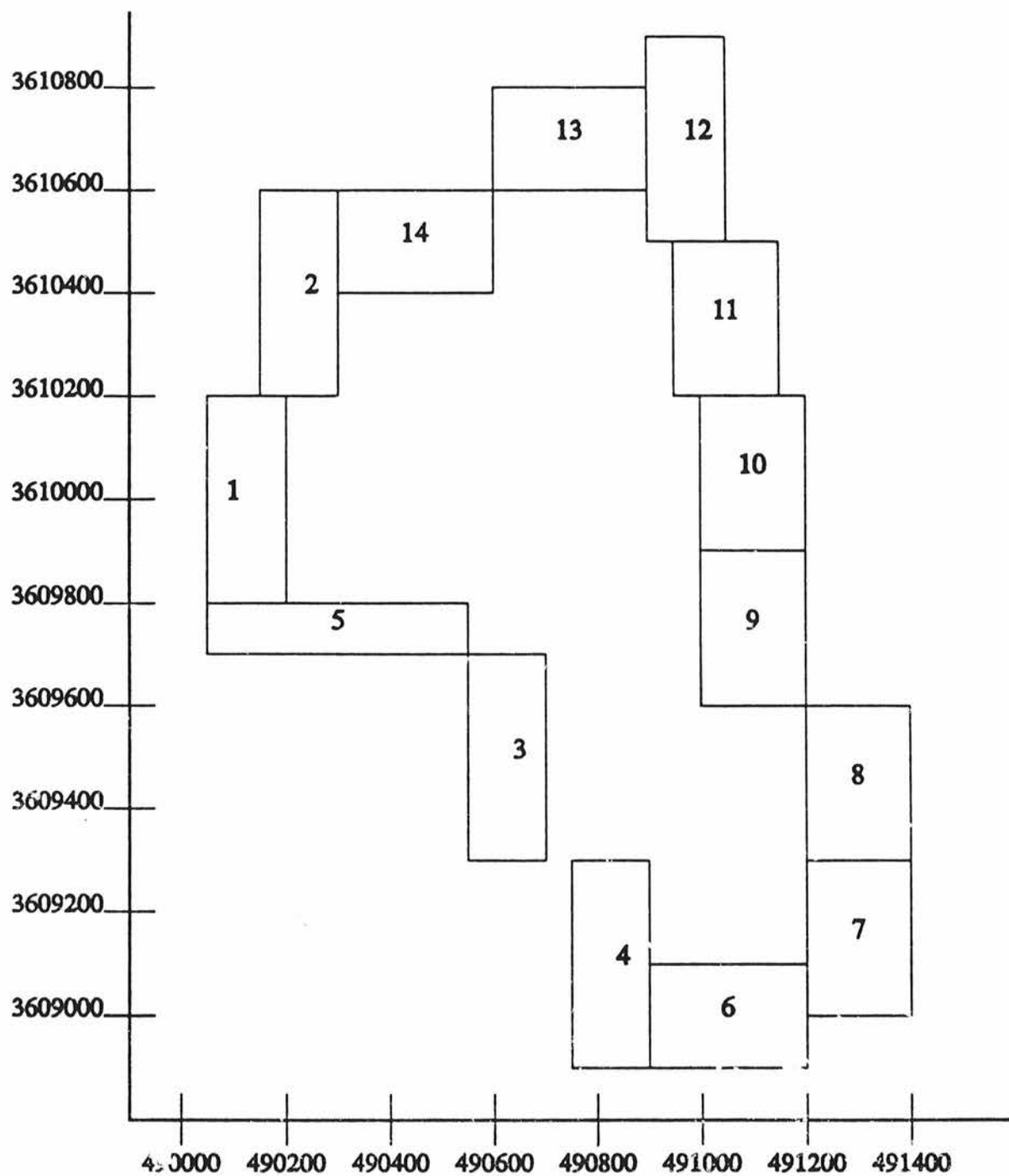


Figure 3. 100m receptor grids

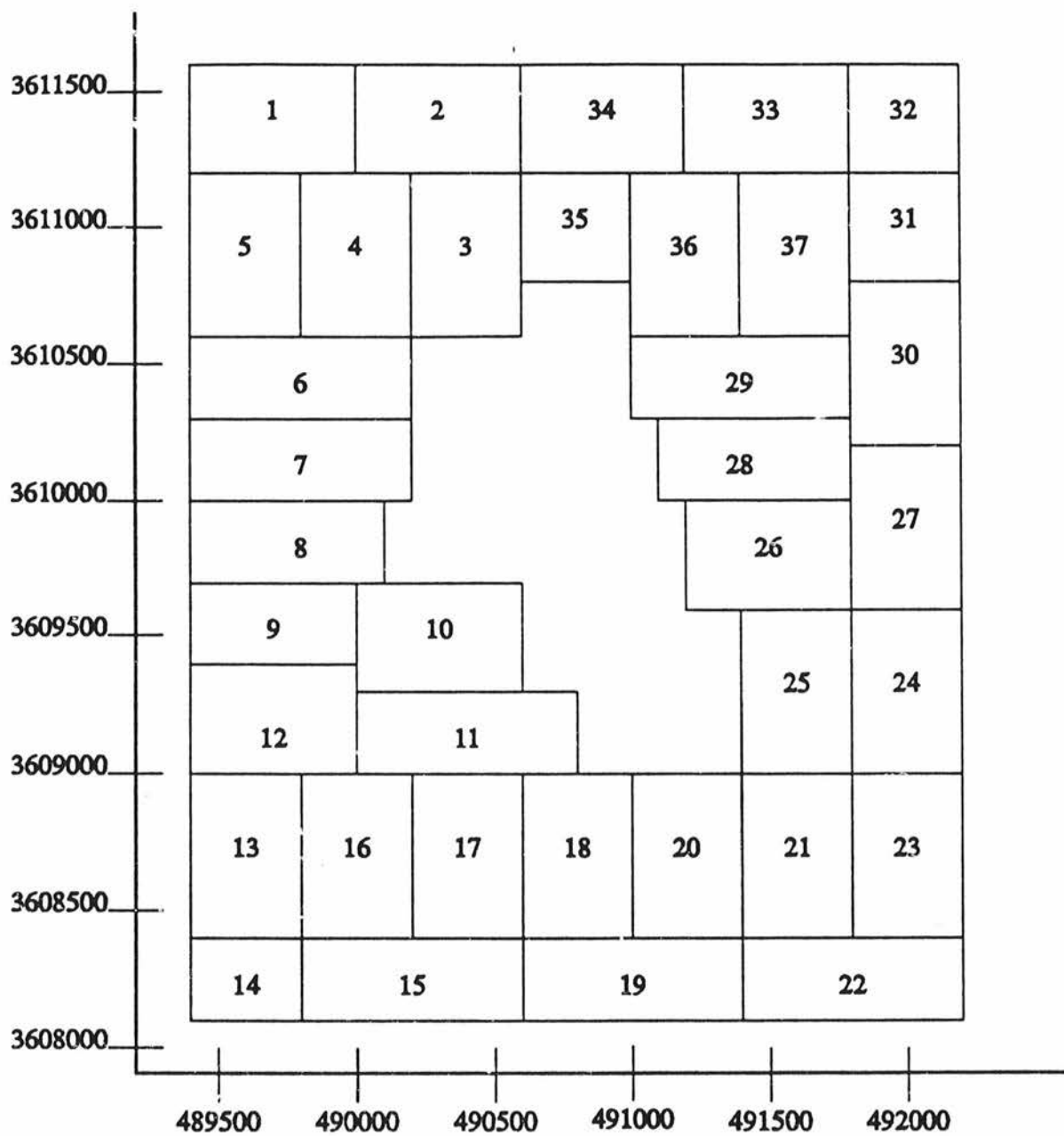
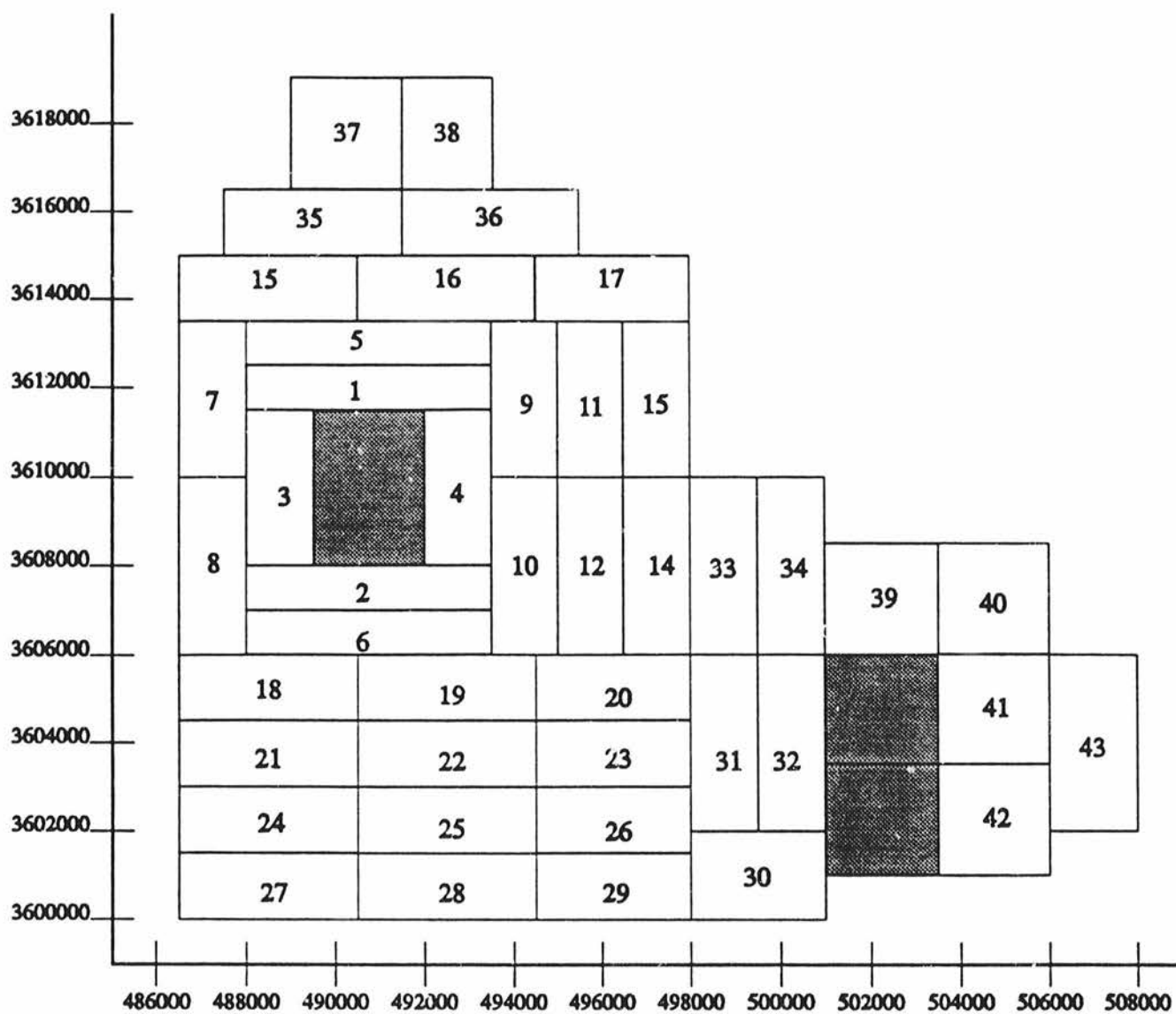


Figure 4. 500m receptor grids

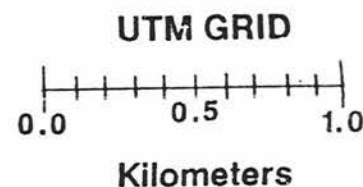
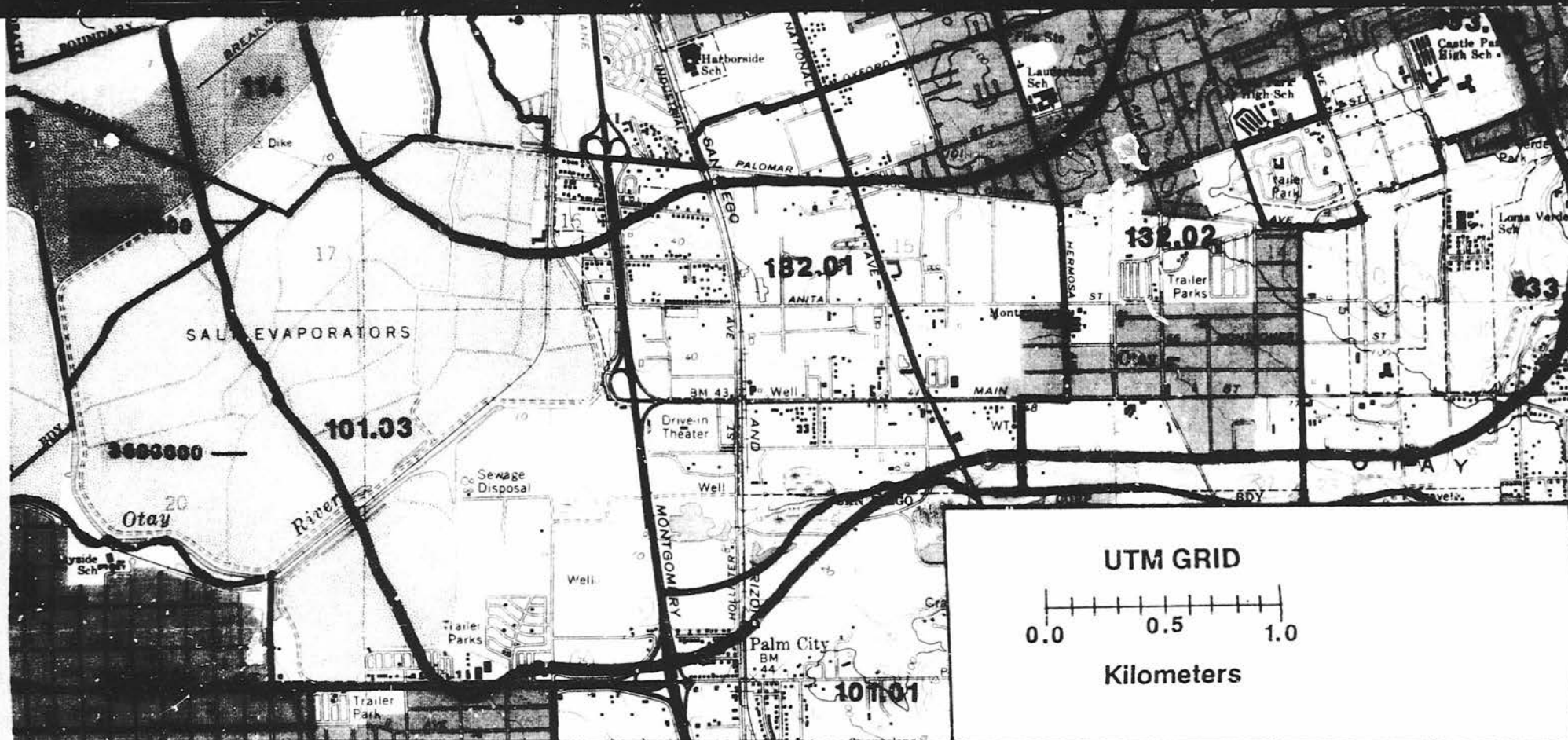


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KLEINFELDER

5





KEY



Census Tract Number



Hospital



School



5 E-4 Risk Isopleth



1 E-4 Risk Isopleth



5 E-5 Risk Isopleth



Acute 1.5



Acute 1.0



Chronic Liver 1.0

USGS 7.5 Minute Topographic Basemap Scale 1:24,000 (1"=2000')

Imperial Beach Quadrangle 1967

National City Quadrangle 1967, photorevised 1975



KLEINFELDER

PROJECT NO. 71-116102 004

PLATE

6

Attachment: TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Perchloroethylene (CAS # 127-18-4).

Completion Date: May 7, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne perchloroethylene facility emissions.

Type of data collected: perchloroethylene emissions, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment: TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Phenol (CAS # 108-95-2).

Completion Date: May 7, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne phenol facility emissions.

Type of data collected: phenol emissions, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment: TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on 4,4'-Diphenylmethane Diisocyanate (aka: benzene, 1,1'-methylenebis[4-isocyanato-, MDI) (CAS # 101-68-8).

Completion Date: May 7, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne MDI facility emissions.

Type of data collected: MDI emissions, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment: TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Hexamethylene Diisocyanate Monomer (aka: hexane, 1,6-diisocyanato-) (CAS # 822-06-0).

Completion Date: May 7, 1992

Purpose. To assess, based on available empirical data, the potential risk of human health posed by airborne hexamethylene diisocyanate monomer facility emissions.

Type of data collected: hexamethylene diisocyanate monomer emissions, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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Attachment: TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Monomeric Toluene Diisocyanate (aka: benzene, 1,3-diisocyanatomethyl-, TDI) (CAS # 26471-62-5).

Completion Date: May 7, 1992

Purpose: To assess, based on available empirical data, the potential risk of human health posed by airborne TDI facility emissions.

Type of data collected: TDI emissions, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

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**AB 2588 RISK ASSESSMENT
FOR
ROHR, INC.**

Submitted to:

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San Diego, California 92123**

**Contact: Tom Weeks
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Prepared for:

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Chula Vista, California 91912-0878**

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Prepared by:

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May 7, 1992

**THIS DOCUMENT WAS PREPARED FOR USE ONLY BY THE CLIENT, ONLY
FOR THE PURPOSES STATED, AND WITHIN A REASONABLE TIME FROM
ITS ISSUANCE. PLEASE READ THE "LIMITATIONS" SECTION OF THIS
REPORT.**

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FOR ROHR, INC.
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EXECUTIVE SUMMARY

This document contains the risk assessment for the Rohr, Inc. facility located at the Foot of H Street in Chula Vista, California. This risk assessment was mandated by California Assembly Bill 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987. The assessment was conducted using emission values generated for the Emission Inventory Report (EIR) dated November 2, 1990 and the EIR Addendum dated February 6, 1991. The emissions data reflect District data, not Rohr data. Rohr specifically asserts the overestimation of these numbers. This HRA was prepared in accordance with the District-approved and mandated Health Risk Assessment Protocols dated December 12 and January 10, 1991, as well as corrections to the calculation errors found in the Protocols.

Cancer risks and hazard indices have been calculated at the site of maximum impact and in other areas of concern surrounding the facility. The maximum increased number of cancer cases (cancer burden or population risk) that might be expected to occur at these sites has also been calculated.

The methods of calculating cancer risk, hazard indices, and cancer burden were based on a "worst-case" situation and are health-conservative in nature. These methods predict the maximum potential risk. That is to say, the real risks are expected to be lower than the predicted number and may be substantially lower, even approaching zero. This health-conservative approach to assessing risk is one chosen by the California Air Pollution Control Officers Association (CAPCOA) and the San Diego Air Pollution Control District (APCD) and is based upon techniques and dose/response values published by the California Department of Health Services (DHS) and the Air Resources Board (ARB).

It is well known that the CAPCOA, DHS and ARB methodologies yield the maximum hypothetical risk and do not relate to actual exposures or risks that could be experienced by persons in the vicinity of the facility. However, the APCD has mandated that all facilities use this approach in preparing their risk assessments. This standardized approach allows comparison of the relative impacts of various facilities on their surroundings.

The total maximum offsite hypothetical calculated individual cancer risk resulting from emissions of AB 2583 compounds at this facility is $7.410\text{E-}04$, located 175 meters east of the

facility boundary in a residential area. This value is the risk for the maximum exposed individual (MEI). The maximum hypothetical calculated individual cancer risk for a commercial receptor is $1.541\text{E-}04$, at a location 25 meters east of the facility boundary.

The maximum distance from the facility to the $1\text{E-}05$ risk isopleth is 20 kilometers southeast of the facility. The maximum distance from the facility to the $5\text{E-}05$ risk isopleth is 5.3 kilometers. The maximum distance to the $1\text{E-}04$ risk isopleth is 3 kilometers southeast of the facility, and the maximum distance to the $5\text{E-}04$ risk isopleth is 600 meters southeast of the facility. The radius of the zone of impact (maximum distance to the $1\text{E-}06$ cancer risk isopleth) is 34 kilometers. The resulting cancer burden from emissions of all AB 2588 compounds for all potentially exposed centroid locations (APCD supplied data) inside the zone of impact is 19.3 for residential population counts, and 1.54 for occupational population counts.

The point of maximum noncarcinogenic chronic hazard index is located 210 meters east of the facility in a residential area. The maximum chronic hazard index at this point is 1.367. The maximum chronic hazard index in a commercial area is 0.23. The target organ with the maximum chronic hazard index is the liver. The maximum acute hazard index of 1.865 occurs approximately 600 meters east of the facility in a residential area. Both the maximum chronic and acute hazard indices exceed the APCD significance level of 1.0.

The maximum distance from the facility to the 1.0 chronic hazard index isopleth for the liver is 400 meters. This isopleth lies partially within residential areas. The maximum distance to the 1.0 and 1.5 acute hazard index isopleths is 1300 meters and 1200 meters, respectively. All of the maximum distances to the hazard index isopleths are east of the facility.

The calculated carcinogenic risk and hazard indices indicate that the facility poses a significant risk according to APCD guidelines. It should be noted that the calculated values are based upon required APCD and CAPCOA conservative assumptions. Therefore, the actual values would be significantly lower than the calculated values derived in this report, even approaching zero. It is in the opinion of this report that no significant health risk occurs in actuality.

1 INTRODUCTION

Kleinfelder, Inc. was retained by Rohr, Inc. to assist with the development of a Health Risk Assessment (HRA) for the Rohr facility located at the Foot of H Street in Chula Vista, California. A risk assessment is required for this facility under Assembly Bill 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588).

Assembly Bill 2588 was enacted by the California State legislature in 1987. The intent of AB 2588 is to gather information on substances which may pose a chronic or acute threat to public health when present in the ambient air. The legislation requires that each Air District prepare a Toxic Air Contaminant Emissions Inventory that identifies significant sources of toxic air emissions in the district. A mechanism by which affected facilities could report their emissions was developed by the California Air Resources Board (CARB) and individual Districts. Potential facility emissions were to be inventoried and quantified for submittal to the Districts in the required Emissions Inventory Plan and Report.

AB 2588 further dictates that the Districts must evaluate air emissions from all reporting facilities and identify those that are prioritized as Category A facilities. A Category A facility is one whose emissions may have a significant impact on the area which surrounds it. Facilities that are identified as Category A are required to perform a risk assessment. The Rohr facility in Chula Vista volunteered to prepare an HRA immediately, and this assessment is provided in response to that commitment.

This document is the risk assessment for the Rohr, Inc. facility located in Chula Vista, California. It contains the results of the assessment, i.e. hazard identification, dose/response considerations, exposure assessment and risk characterization. The assessment has been prepared according to the requirements of the California Air Pollution Control Officers Association (CAPCOA) and San Diego Air Pollution Control District (APCD). The specific requirements of the APCD have been used along with CAPCOA guidelines for preparation of the assessment.

This risk assessment is based upon the emission estimates submitted to the APCD in the Emission Inventory Report (EIR) dated November 2, 1990 and the EIR Addendum dated February 6, 1991, and in accordance with the District-approved Health Risk Assessment

Protocols dated December 12 and January 10, 1991, as well as corrections to the calculation errors found in the Protocols. The emissions submitted by Rohr were significantly altered by the District without any consultation with Rohr and unbeknownst to Rohr. Upon Rohr's discovery of these changes, Rohr has sought bases for the changes, but has not received any to date. The District has promised to supply justification for these emissions changes. Rohr is now source testing some sources to disprove the District's figures. These emission estimates are coupled with air dispersion models to calculate ambient air concentrations of the emitted compounds using the ACE 2588 data reduction program. The calculated ambient concentrations are then used in accordance with the procedures detailed by the California Air Pollution Control Officers Association (CAPCOA) to arrive at a health-conservative estimate of increased individual cancer risk that might occur as a result of continuous exposure to the chemicals over a 70-year lifetime. In similar fashion, calculated concentrations of compounds with noncarcinogenic adverse health effects are used to calculate hazard indices (ratio of the calculated exposure to acceptable exposure).

The methodology and results of the air dispersion modeling and ACE 2588 data reduction program are discussed in Section 2 of this report and are displayed in Appendices B, C and D. Section 2.1 discusses the emission quantity estimates. Significant changes to the District-approved EIR and HRA Protocol were made for this assessment. However, based on Rohr records the new data are found to be more representative of potential emissions from the facility. The changes have been conducted and approved by the District both through written and verbal communications.

Section 2.3 of this report discusses the air dispersion modeling. The standard Industrial Source Complex model, with the Montgomery Field and Lindbergh Field meteorological station data provided by Trinity Consultants, was used to calculate the ambient concentration of emitted compounds (surface station #23188, upper air #03131). Copies of the model runs are included in Appendix B and Appendix C and IBM-compatible ASCII diskettes of the model input and results are included with this report.

Dose/response values used in the risk assessment are described in Section 3 of this report. The dose/response values published by CAPCOA in the AB 2588 Risk Assessment Guidelines dated January 1, 1991 were used without modification in the assessment. Section 4 of this report presents the results of the assessment. Isopleth maps of exposure are shown in Appendix D.

2 MODELING METHODOLOGY

2.1 Introduction and Emission Quantities

The Rohr, Inc. site is an aerospace industrial facility which manufactures airplane accessories and components. Emissions are related to principal processes such as metal surface treatment, metal forming, primary fabrication, assembly, surface coating, paint curing, degreasing, and welding. The chemicals emitted - as reported in the Emissions Inventory Report (EIR) and included in the District-approved HRA Protocol - that were considered in this assessment are arsenic, benzene, beryllium, cadmium, hexavalent chromium, copper, 1,4 dioxane, formaldehyde, glycol ethers, hydrochloric acid, hydrogen fluoride, isocyanates, lead, manganese, mercury, methanol, methyl chloroform, methylene chloride, nickel, perchloroethylene, selenium, sodium hydroxide, toluene, xylene, zinc, and phenol. The quantities emitted from each emitting device, maximum hourly and annual average rates, are shown in Appendix C of this report.

Significant changes to the reported emissions in the District-approved EIR and HRA Protocol were made during the preparation of this risk assessment. Based on Rohr records the new data are found to be more representative of potential emissions from the facility, but in Rohr's opinion are still grossly in excess of actual emissions. The changes have been conducted and approved by the District both through written and verbal communications. The District approved changes for the foundry crucibles, alodine aluminum line, and maskant dip tank and curing oven in a correspondence addressed to Rohr dated April 21, 1992. Kleinfelder submitted the revised HRA Protocol "Emissions and Release Parameters" forms to the District in a correspondence dated April 28, 1992. Thomas Weeks of the APCD confirmed the revised emission rates in a telephone conversation on May 1, 1992.

A summary of the changes is as follows. Lead and Kirksite throughput values were corrected for devices PFD01-03 and PFD06-07. In addition, a 10% conversion of chromium to hexavalent chromium in the Kirksite furnaces was incorporated into the emission rates (Source PFD01-03). Emissions of hexavalent chromium were assumed to be negligible for tank PAA01 in the alodine aluminum line because of a lack of emission mechanisms. Corrections in the maximum hourly solvent/thinner usage were incorporated

resulting in changes in the maximum hourly release of perchloroethylene and toluene from the maskant dip tank (PPD01) and curing oven (POV03).

The revised emission rates are incorporated in the HRA. No other changes have been made to the HRA Protocol. That is, all other emission rates used are those found in the HRA Protocol.

A plot plan of the facility including the location of emitting points and plant boundaries is shown in Appendix D, Figure 1.

2.2 Facility Location and Surroundings

The Rohr facility is located in a commercial/industrial area immediately adjacent to Interstate Highway 5 in Chula Vista, California. The nearest residences are approximately 150 meters east of the facility. A map showing the surrounding area is included in Appendix D. A total of 297 census tract centroid locations were assessed for cancer burden by the impact of this facility. Sensitive receptors, i.e., schools and hospitals, were identified with the Thomas Brothers and USGS maps. The sensitive receptors identified by the Thomas Brothers and USGS maps are shown on the maps in Appendix D, Figure 6. Sensitive receptors were modeled following the methodology described in Section 2.3

2.3 Impact Modeling Methodology

In order to calculate the hypothetical maximum exposure of persons to emitted compounds, the ISCST simple terrain dispersion model and the COMPLEX1 complex terrain dispersion model were used. The ACE 2588 program, CAPCOA's data reduction and multipathway analyses program, was used in conjunction with the ISCST model to reduce the ISCST data. ISCST is a multi-source model that accepts point, area and volume emitting sources, and calculates ambient air concentrations for receptors on simple and intermediate terrain. COMPLEX1 is a multi-source model that accepts only point sources, and is used to calculate ambient air concentrations for receptors located on intermediate and complex terrain.

Meteorological data from the Montgomery Field and Lindbergh Field meteorological stations, as provided by Trinity Consultants, were utilized in the model. No independent verification of the Trinity Consultant meteorological data was conducted. Three

consecutive years of meteorological data (1985-1987) were used in a preliminary run to determine the data set that would result in the worst case risk and health hazard index values. It was determined that the meteorological data from 1986 was the worst case year (highest MEI cancer risk), and this data set was used throughout the study. The output from the model runs used to compare the three years is shown in Appendix B.

The model was run with all "regulatory default" switches set. The "rural" option was chosen to incorporate the more conservative rural dispersion coefficients (σ_y and σ_z). The Schulman-Scire building downwash option was implemented in ISCST. COMPLEX1 cannot address building downwash.

For point source emissions (i.e., stacks) identified in the EIR, the reported EIR and HRA Protocol emission characteristics (i.e., stack diameter, flow rate, height and exhaust gas temperature) were used without modification in ISCST. The fugitive emissions were treated as single effective volume sources equal to the smallest building volume containing the fugitive emissions. One fugitive source that was located outside was treated as an area source. Because of program limitations and the large number of sources at the facility, the sources were divided into two sets of input files; two runs were made for each receptor grid, and the results were combined to yield total ambient concentrations. Table 1 contains a complete listing of the sources.

The receptor grids used for the modeling performed are in accordance with the District-approved HRA Protocol. Receptors for ambient concentration calculations were placed on 14 grids with 50 meter spacing extending to a point 200 meters from facility boundary in all four directions (east, west, north and south). Beyond the 50-meter spaced "inner grid" is a second series of 37 grids with 100 meter spacing. These grids extend to one kilometer beyond the facility boundary in all four directions. A series of 43 receptor grids with 500 meter spacing were used beyond this point and extended until the $1E-05$ cancer risk isopleth was captured. Figures 2 through 4 in Appendix D show the UTM locations of the receptors in each grid.

Parts of the $1E-05$ isopleth extended into Mexico and over the Pacific Ocean. For this isopleth these parts were truncated to remain on United States territory.

For the receptors located on intermediate terrain (elevations above the lowest stack height and below the highest plume rise), the complex terrain model COMPLEX1 was used for

comparison with ISCST results. Six sources accounting for 99.1% of the cancer risk at the MEI calculated by ISCST were modeled with COMPLEX1. Hexavalent chromium accounted for 98% of the MEI cancer risks. Therefore, hexavalent chromium emission rates from the six devices were coupled with the unit concentrations calculated by COMPLEX1 to determine ambient concentrations and cancer risks. The results showed that ISCST predicted higher concentrations and cancer risks at the MEI. Therefore, ISCST was used for the rest of the modeling in order to retain the more conservative (higher) concentration and cancer risk values. Table 2 shows the COMPLEX1/ISCST comparison.

For receptors on simple terrain (elevations lower than lowest stack height), only the ISCST program was used. The APCD requires that COMPLEX1 be used for receptors on complex terrain (elevations higher than the highest plume rise). Complex terrain was encountered at the 1E-05 isopleth, which lies over the Otay mountains. The COMPLEX1 modeling for the complex terrain receptors will be completed and the results submitted to the APCD in an addendum to this HRA at a later date.

Dispersion modeling was conducted assuming a unit emission rate of one gram per second for all devices. The modeling results provide, therefore, a relative concentration. Actual emission rates for each emitting source were input to the ACE 2588 model. The ACE 2588 model completes data reduction and provides the specific ground level concentrations per device, using the relative concentrations provided by the dispersion modeling output files. Both the annual average and maximum one-hour concentrations were calculated. Identification of the maximum exposure impact point was conducted using the ACE 2588 model. Copies of the dispersion model output results (relative concentrations) for the maximum impact point grid are provided in Appendix B. Calculated concentrations for each emitted compound are shown in Appendix C.

The worker (commercial) area concentrations are multiplied by a factor of 0.144 to adjust the exposure period. Per the CAPCOA Guidelines, the worker exposure period is 8 hours per day, 240 days per year for 46 years (as opposed to a 70 year lifetime residential exposure)

No background concentrations of pollutants were added to the model results (the background concentrations of chemicals not emitted by the facility are likely to indicate a risk much greater than that posed by the facility).

2.4 Building Downwash Considerations

Calculation of ground level concentrations by the dispersion model was performed to incorporate all representative building downwash parameters. A model was used that specifically produces direction-specific building dimensions for use in Schulman-Scire downwash algorithms. ISCST performs Schulman-Scire calculations where appropriate.

2.5 Exposed Population Data

The zone of impact is defined by the APCD to be a circle whose radius is from the facility to the farthest point on the $1E-06$ cancer risk isopleth. Because the distance from the Rohr facility to the farthest point on its $1E-06$ isopleth lies in Mexico, the distance from the facility to the farthest point of the $1E-06$ isopleth in the United States is used as the radius for the zone of impact. In accordance to the HRA Protocol and telephone conversations with APCD officers, a coarse grid (2 kilometer receptor spacing) was used to capture points on the $1E-06$ isopleth.

Census tract population data were obtained from the APCD (centroid locations). The impacted population estimates and calculated cancer burden are shown in Table 4. Cancer risks for centroid receptors were calculated following the methodology described in Section 2.3. The risk at each centroid was then multiplied by the appropriate population figure in each census tract to determine the cancer burden. The burden values for each tract were summed to obtain the total facility cancer burden.

3 DOSE/RESPONSE VALUES

3.1 DHS and EPA Cancer Potency Values

Table III-6 in the CAPCOA Risk Assessment Guidelines indicates those compounds for which the DHS and the US Environmental Protection Agency (EPA) have developed a unit risk value. Of the chemicals emitted at the Rohr facility, arsenic, benzene, beryllium, cadmium, hexavalent chromium, 1,4-dioxane, formaldehyde, methylene chloride, nickel, and perchloroethylene are listed in Table III-6 of the CAPCOA Guidelines. However, the ACE 2588 program considers the screening values for lead and isocyanates in the total cancer risk (i.e., the model does not break out the risk values for these two compounds). The values for Table III-6 compounds are shown as part of the ACE 2588 reduction data in Appendix C of this report.

3.2 CAPCOA Screening Cancer Potency Values

In addition to the potency values determined by DHS and EPA for the chemicals shown by CAPCOA in Table III-6, CAPCOA has reported screening potency values that can be used at District option. Values in this table include those for lead, isocyanates and selenium. Screening values for these compounds are listed in CAPCOA Table III-7 and are shown in Appendix C of this report. The screening potency values are considered overly conservative; generally they represent worst case unit risks for compounds that may be carcinogenic but require more experimentation to arrive at a representative unit risk value. Risk associated with screening potency values was not added to risk values generated with DHS and EPA cancer potency values, with the exception of lead and isocyanates. The screening cancer risk results are reported separately in Section 4 of this report.

3.3 Noncancer Acceptable Exposure Values

All of the emitted chemicals, with the exception of arsenic and 1,4-dioxane, also have potential noncancer health effects through chronic exposure. These effects may occur when persons are exposed to concentrations greater than the CAPCOA published noncancer acceptable exposure levels. Acceptable chronic (i.e., long term, annual average) and acute (i.e., short term, maximum hourly) exposure levels are shown in Tables III-8 and

III-9 of the CAPCOA Guidelines. Only formaldehyde, hydrochloric acid, hydrogen fluoride, lead, methylene chloride, and perchloroethylene have been assigned acceptable acute exposure levels. The acceptable levels are shown as part of the ACE 2588 output data file in Appendix C of this report.

3.4 Multipathway Analysis of Exposures

Persons can be exposed to some chemicals from pathways other than direct inhalation. These pathways include dermal exposure, water ingestion, crop ingestion and soil ingestion. Of the emitted chemicals from the Rohr facility, arsenic, beryllium, cadmium, hexavalent chromium, copper, formaldehyde, lead, manganese, mercury, methyl chloroform, methylene chloride, nickel, perchloroethylene, selenium, toluene, xylene, zinc, and phenol are subject to multipathway exposure (as shown in Table III-5 of the CAPCOA Guidelines). Results from the multipathway component are combined with inhalation pathway results by the ACE 2588 data reduction model and are shown in Appendix C of this report.

4 RESULTS OF ASSESSMENT

4.1 Carcinogenic Risk Results at Maximum Impact Point

The ACE 2588 data reduction modeling results contained in Appendix C display the emission rates of each chemical from the emitting devices/areas of the facility, the relative ambient concentration derived from the ISCST modeling at the point of maximum impact, the calculated concentration of each emitted chemical from each device, the unit cancer risk for each chemical, and the resultant maximum cancer risk from each chemical and device. Appendix C shows the total cancer risk for all devices and chemicals at the point of maximum exposure. Appendix C also displays the chemicals for which there are only CAPCOA screening potency values available.

The concentration of each chemical is calculated as shown in sample equations of Appendix A and is simply the product of the modeled ambient relative concentration determined from the ISCST model at the receptor of interest and the emission rate for that chemical and device. The cancer risk for each device and chemical is the product of the unit cancer risk obtained from the CAPCOA Guidelines times the calculated ambient concentration for that chemical and device.

The total maximum offsite hypothetical calculated individual cancer risk resulting from emissions of AB 2588 compounds at this facility is $7.410\text{E-}04$, located 175 meters east of the facility boundary in a residential area. This value is the risk for the maximum exposed individual (MEI). The maximum hypothetical calculated individual cancer risk for a commercial receptor is $1.541\text{E-}04$, at a location 25 meters east of the facility boundary. This risk incorporates the CAPCOA worker adjustment factor of 0.144 (the risk value is $1.070\text{E-}03$ without the worker factor). The MEI cancer risk is above the APCD significance level of $1\text{E-}05$.

The maximum risk for screening chemicals is $3.888\text{E-}10$, which is attributable to selenium emissions. The point of maximum risk for screening chemicals is located 175 meters east of the facility boundary.

4.2 Carcinogenic Impact Results Within Maximum Impact Zone

The dispersion modeling results of Appendix B and the ACE 2588 data reduction program results of Appendix C indicate that the maximum distance from the facility to the 1E-05 risk isopleth is 20 kilometers southeast of the facility (Figure 5). The maximum distance from the facility to the 5E-05 risk isopleth is 5.3 kilometers. The maximum distance to the 1E-04 risk isopleth is 3 kilometers southeast of the facility, and the maximum distance to the 5E-04 risk isopleth is 600 meters southeast of the facility. The 5E-05, 1E-04, and 5E-04 isopleths are shown in Figure 6. There is no 1E-03 isopleth when the 0.144 worker factor is applied. The adjustment is appropriate because the unadjusted 1E-03 isopleth lies entirely within a commercial area.

Multiplying the calculated cancer risk at each census tract centroid within the zone of impact with the population within the census tract yields the excess cancer burden (as is shown in Table 4) in that tract. The sum of the census tract burden values is the facility excess cancer burden. The radius of the zone of impact as defined in Section 2.5 is 34 kilometers (Figure 5). The resulting cancer burden from emissions of all AB 2588 compounds for all potentially exposed centroid locations is 19.3 for residential population, and 1.54 for occupational population counts. The occupational cancer burden values take into account the worker adjustment factor of 0.144. That is, the calculated cancer risk is multiplied by 0.144 before being multiplied by the worker population in each census tract. A maximum calculated value is obtained for each centroid location (a receptor location) inside the zone of impact that is assumed to be representative of exposure for the total population found within that census tract.

The excess cancer burden for a population is an estimate of the possible increased number of cancer cases in a population as a result of a given exposure to emitted carcinogens. This estimate conservatively assumes that the entire population is exposed to that maximum value found at the associated centroid location. For any population unit the cancer burden is the product of the exposed population and the calculated individual risk from inhalation exposure and other pathways, where appropriate. Because of the conservative nature of the calculation of individual risk used in this document, this cancer burden is a maximum estimate. In other words, the number of predicted excess cancer cases is not expected to be higher than the calculated number and may very well be much lower.

Sensitive receptors (i.e., schools, hospitals, convalescent homes) within the zone of impact where the risk is greater than $1\text{E-}05$ for residences (i.e., risk not adjusted for worker exposure) are shown in Appendix D, Figure 6. Cancer risks and hazard indices at sensitive receptors are shown in Table 3.

The maximum risk for screening chemicals is $3.888\text{E-}10$, which is attributable to selenium emissions. The point of maximum risk for screening chemicals is located 175 meters east of the facility boundary.

4.3 Noncancer Impact Results

Appendix C displays the calculated noncancer impacts. The point of maximum noncarcinogenic chronic hazard index is located 210 meters east of the facility in a residential area. The maximum chronic hazard index at this point is 1.367. The maximum chronic hazard index in a commercial area is 0.23. This value incorporates the CAPCOA worker adjustment factor of 0.144 (the hazard index value is 1.6 without the worker factor). The target organ with the maximum chronic hazard index is the liver. The maximum acute hazard index of 1.865 occurs approximately 600 meters east of the facility in a residential area. Both the maximum chronic and acute hazard indices exceed the APCD significance level of 1.0 (Figure 6).

The maximum distance from the facility to the 1.0 chronic hazard index isopleth for the liver is 400 meters. This isopleth lies partially within residential areas. There is no 1.5 chronic hazard index isopleth for the liver, nor a 1.0 chronic hazard index isopleth for the central nervous system and the respiratory system when the 0.144 worker factor is applied. The adjustments made here are appropriate because these unadjusted chronic hazard index isopleths lie entirely within commercial areas. The maximum distance to the 1.0 and 1.5 acute hazard index isopleths is 1300 meters and 1200 meters, respectively. All of the maximum distances to the hazard index isopleths are east of the facility.

4.4 Summary

The calculated potential cancer and noncancer impacts for compounds for which potency levels are established exceed the significance levels of $1\text{E-}05$ and 1.0 for risk and hazard index, respectively.

The calculated carcinogenic risk and hazard indices indicate that the facility poses a significant risk according to APCD guidelines. It should be noted that the calculated values are based upon required APCD and CAPCOA conservative assumptions. Therefore, the actual values would be significantly lower than the calculated values derived in this report, even approaching zero.

5 LIMITATIONS

This report was prepared in general accordance with the accepted standard of care that existed in Southern California at the time the report was written. It should be recognized that determining all possible emission scenarios and substances is difficult. Judgments leading to the conclusions and recommendations are generally made with an incomplete knowledge of the facility. Kleinfelder should be notified for additional consultation if the client wishes to reduce the uncertainties beyond the level associated with this report. No warranty, expressed or implied, is made.

This report may be used only by Rohr and the San Diego Air Pollution Control District and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than Rohr who wishes to use this report shall notify Kleinfelder of such intended use. Based upon the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Noncompliance with any of these requirements by Kleinfelder or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

Table 1 - Sources

Source Group A Source Number	Grouped Devices	Actual Device
1	SNG04	
2	SNG09	
3	SNG10	
4	SNG11	
5	SNG12	
6	SNG13	
7	SNG14	
8	SNG15	
9	SNG16	
10	SNG17	
11	SNG19	
12	SPB04	
13	SPB05	
14	SPB06	
15	SPB19	
16	SPB25	
17	SPB26	
18	SPB27	
19	SPB28	
20	SPB29	
21	SPB30	
22	SPB31	
23	SPB32	
24	SPB33	
25	SPB34	
26	SPB35	
27	SPB36	
28	SPB37	
29	SPB38	
30	SPB39	
31	SPB45	
32	SOV01	
33	SOV08	
34	SOV13	
35	SOV09	
36	BLDG 1A	PBF01 PDG25 PDG26 PDG27 PDG28 PDG29
37	BLDG 1B	PDG02 PDG03 PWL01
38	SPD01	
39	BLDG 5	PDG04
40	BLDG 36	PDG05

Source Group B Source Number	Grouped Devices	Actual Device
1	BLDG 45A	PDG06 PDG07
2	BLDG 45B	PDG08 PTS03
3	BLDG 443	PDG09
4	BLDG 912	PDG10
5	SDG01	
6	BLDG 452	PDG12
7	BLDG 48	PDG16 PDG17
8	BLDG 910	PDG20
9	PDG30	PDG22 PDG33 PBF04
10	BLDG 3	PDG21 PBF02
11	BLDG 30	PDG22 PDG33 PBF04
12	BLDG 911	PDG33
13	BLDG 34	PDG34
14	BLDG 61	PBF06
15	PCT01	
16	PCT03	
17	PCT04	
18	PCT05	
19	PCT06	
20	PCT08	
21	PCT12	
22	AL02	
23	SAA01	
24	SCN01	
25	SCM01	
26	SCM02	
27	SCM03	
28	SCM04	
29	SPA02	
30	SHT01	
31	SFD07	
32	SFD01	
33	SFD02	
34	SFD03	
35	SFD06	
36	SGT01	
37	SGT02	

COMPLEX1 - ISCST Comparison

Table 2

		Cr Emission	Calculated	
#22 - SAL02	Unit Conc.	Rate (g/s)	Concentration	
Receptor				
MEI	2.900E-01	3.686E-04	1.069E-04	
#23 - SAA01				
Receptor				
MEI	7.300E-01	1.495E-04	1.091E-04	
#24 - SCN01				
Receptor				
MEI	2.300E-01	6.807E-05	1.566E-05	
#25 - SCM01				
Receptor				
MEI	3.000E-02	2.142E-04	6.426E-06	
#26 - SCM02				
Receptor				
MEI	3.000E-02	2.105E-04	6.315E-06	
#30 - SHT01				
Receptor				
MEI	9.000E+00	3.571E-04	3.214E-03	
			COMPLEX1	97.1% ISCST
		Receptor	Risk	Risk
		MEI	4.842E-04	7.196E-04

Table 3 - Health Hazards for Sensitive Receptors

Sensitive Receptor	UTM X (m)	UTM Y (m)	Cancer Risk	Acute HHI	Chronic CV HHI	Chronic CNS HHI
Mueller School	491300	3609700	1.054E-04	1.550E-01	1.089E-03	1.827E-01
Vista Square School	491900	3610600	1.051E-04	7.649E-01	1.456E-03	1.741E-01
Vista Square JHS	492100	3610600	8.495E-05	5.927E-01	1.139E-03	1.423E-01
Boys' Club	492250	3609950	1.179E-04	5.187E-01	2.087E-03	2.048E-01
Chula Vista HS	492750	3609150	1.731E-04	5.388E-01	2.547E-03	2.623E-01
Rice School	493050	3608950	1.296E-05	4.106E-01	9.079E-05	2.162E-01
Chula Vista Hospital	493400	3608700	1.272E-04	3.646E-01	1.730E-03	1.957E-01
St. Rose Lima School	492850	3610650	4.946E-05	2.990E-01	5.890E-04	6.878E-01
Bay General Hospital	492150	3610500	8.536E-05	4.672E-01	1.084E-03	1.330E-01
Community Hospital	491600	3611000	1.162E-04	7.481E-01	1.689E-03	1.856E-01
Feaster School	491000	3610350	5.198E-04	3.946E-01	1.019E-02	1.405E-01
Harborside School	492000	3607700	1.209E-04	6.128E-01	1.092E-03	1.626E-01

Sensitive Receptor	UTM X (m)	UTM Y (m)	Chronic Immun HHI	Chronic Kidney HHI	Chronic Liver HHI	Chronic Repro HHI	Chronic Resp HHI
Mueller School	491300	3609700	2.294E-02	2.829E-02	1.856E-01	3.736E-03	1.743E-01
Vista Square School	491900	3610600	1.606E-03	9.916E-03	1.784E-01	1.511E-03	2.479E-01
Vista Square JHS	492100	3610600	1.267E-03	8.011E-03	1.458E-01	1.186E-03	2.022E-01
Boys' Club	492250	3609950	2.251E-03	1.174E-02	2.094E-01	2.147E-03	2.700E-01
Chula Vista HS	492750	3609150	2.832E-03	1.624E-02	2.693E-01	2.636E-03	3.905E-01
Rice School	493050	3608950	1.014E-04	3.555E-03	2.161E-01	9.483E-05	3.444E-01
Chula Vista Hospital	493400	3608700	1.907E-03	1.184E-02	2.009E-01	1.796E-03	3.016E-01
St. Rose Lima School	492850	3610650	6.714E-04	4.472E-03	6.890E-01	6.160E-04	1.150E-01
Bay General Hospital	492150	3610500	1.214E-03	7.855E-03	1.365E-01	1.132E-03	2.012E-01
Community Hospital	491600	3611000	1.865E-03	1.109E-02	1.904E-01	1.746E-03	2.776E-01
Feaster School	491000	3610350	2.315E-02	5.351E-02	1.592E-01	1.222E-02	1.535E-01
Harborside School	492000	3607700	1.277E-03	1.039E-02	1.677E-01	1.171E-03	3.094E-01

Table 4 - Census Tract Risks and Cancer Burden

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
1.00	482700	3623700	2.886E-06	3636	495	0.0105	0.0014	0.0002
2.00	483600	3623000	2.894E-06	6813	1953	0.0197	0.0057	0.0008
3.00	484800	3622700	3.469E-06	4949	4079	0.0172	0.0142	0.0020
4.00	484800	3623500	3.094E-06	3325	9619	0.0103	0.0298	0.0043
5.00	485900	3624500	2.865E-06	3190	2325	0.0091	0.0067	0.0010
6.00	485800	3623500	3.282E-06	3216	2307	0.0106	0.0076	0.0011
7.00	485800	3622700	3.403E-06	3594	892	0.0122	0.0030	0.0004
8.00	486700	3622700	3.276E-06	4403	225	0.0144	0.0007	0.0001
9.00	486700	3623500	2.915E-06	4710	1381	0.0137	0.0040	0.0006
10.00	486700	3624300	2.769E-06	4578	933	0.0127	0.0026	0.0004
11.00	487500	3624800	3.855E-06	2960	1333	0.0114	0.0051	0.0007
12.00	487600	3624200	4.034E-06	4038	1695	0.0163	0.0068	0.0010
13.00	487600	3623500	4.048E-06	4133	2537	0.0167	0.0103	0.0015
14.00	487500	3622700	3.812E-06	2847	1574	0.0109	0.0060	0.0009
15.00	488400	3622500	5.492E-06	3597	548	0.0198	0.0030	0.0004
16.00	488600	36223600	2.635E-07	3615	1061	0.0010	0.0003	0.0000
17.00	488600	3624200	5.107E-06	4099	472	0.0209	0.0024	0.0003
18.00	488900	3624700	5.360E-06	5149	1173	0.0276	0.0063	0.0009
19.00	488800	3625300	5.052E-06	3476	107	0.0176	0.0005	0.0001
20.01	490100	3625300	5.054E-06	3488	899	0.0176	0.0045	0.0007
20.02	491400	3624700	4.553E-06	2495	57	0.0114	0.0003	0.0000
21.00	489800	3624300	5.763E-06	4860	1426	0.0280	0.0082	0.0012
22.00	489700	3623500	6.337E-06	6009	2157	0.0381	0.0137	0.0020
23.00	490900	3623500	5.397E-06	5401	2202	0.0291	0.0119	0.0017
24.00	489700	3622900	6.767E-06	6340	1208	0.0429	0.0082	0.0012
25.01	489800	3622300	7.184E-06	3999	141	0.0287	0.0010	0.0001
25.02	489900	3620800	8.586E-06	5193	927	0.0446	0.0080	0.0011
26.00	490800	3622400	6.198E-06	8184	680	0.0507	0.0042	0.0006
27.01	491800	3623600	5.094E-06	6684	1102	0.0340	0.0056	0.0008
27.02	493100	3623800	3.763E-06	3624	2041	0.0136	0.0077	0.0011
27.03	493600	3622800	4.223E-06	5406	1042	0.0228	0.0044	0.0006
27.04	491800	3622600	5.572E-06	5242	485	0.0292	0.0027	0.0004
27.05	492100	3621400	5.529E-06	3080	297	0.0170	0.0016	0.0002
27.06	492800	3621200	4.854E-06	6102	2908	0.0296	0.0141	0.0020
28.01	492300	3626000	3.853E-06	3740	6352	0.0144	0.0245	0.0035
28.02	492600	3624900	3.743E-06	8555	1698	0.0320	0.0064	0.0009
29.01	494400	3625700	4.445E-06	9875	6294	0.0439	0.0280	0.0040
29.02	494300	3624400	4.758E-06	4639	1318	0.0221	0.0063	0.0009
29.03	494900	3623300	4.494E-06	3281	898	0.0147	0.0040	0.0006
30.01	492900	3619600	3.969E-06	4812	393	0.0191	0.0016	0.0002
30.02	494000	3620100	4.053E-06	7889	1541	0.0320	0.0062	0.0009
31.01	492400	3617500	4.313E-06	3633	80	0.0157	0.0003	0.0000

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
31.02	493600	3617600	4.304E-06	3633	80	0.0156	0.0003	0.0000
31.03	495700	3618500	4.880E-06	10763	997	0.0525	0.0049	0.0007
31.04	495400	3616900	4.109E-06	6098	253	0.0251	0.0010	0.0001
31.05	497000	3618900	3.545E-06	9554	805	0.0339	0.0029	0.0004
31.07	497700	3618100	3.052E-06	5635	231	0.0172	0.0007	0.0001
31.08	498500	3618500	2.770E-06	3450	415	0.0096	0.0011	0.0002
32.01	494200	3615800	4.484E-06	5441	248	0.0244	0.0011	0.0002
32.02	493800	3614400	4.633E-06	4137	174	0.0192	0.0008	0.0001
32.03	494700	3614700	4.655E-06	7739	547	0.0360	0.0025	0.0004
32.04	494300	3612700	2.604E-07	3792	1332	0.0010	0.0003	0.0000
32.06	496600	3616100	3.771E-06	16126	1215	0.0608	0.0046	0.0007
32.07	495800	3614600	3.602E-06	5250	582	0.0189	0.0021	0.0003
33.00	490900	3617700	4.571E-06	10038	2006	0.0459	0.0092	0.0013
34.01	491400	3620500	4.311E-06	4858	1436	0.0209	0.0062	0.0009
34.02	488900	3619200	5.360E-06	8033	3194	0.0431	0.0171	0.0025
35.00	489100	3618000	5.754E-06	6187	523	0.0356	0.0030	0.0004
36.00	489400	3616600	6.393E-06	9894	3018	0.0632	0.0193	0.0028
38.00	488500	3616100	5.236E-06	15685	27356	0.0821	0.1432	0.0206
39.00	488000	3617600	4.803E-06	8150	2106	0.0391	0.0101	0.0015
40.00	487900	3618700	4.658E-06	3633	472	0.0169	0.0022	0.0003
41.00	488100	3619400	5.144E-06	5086	2345	0.0262	0.0121	0.0017
42.00	488800	3621000	6.041E-06	6343	654	0.0383	0.0040	0.0006
43.00	487800	3621600	4.387E-06	4149	186	0.0182	0.0008	0.0001
44.00	487800	3620400	4.363E-06	4133	763	0.0180	0.0033	0.0005
45.00	487000	3619300	3.165E-06	4702	831	0.0149	0.0026	0.0004
46.00	486400	3619400	3.568E-06	2137	1314	0.0076	0.0047	0.0007
47.00	486400	3618600	4.036E-06	2197	721	0.0089	0.0029	0.0004
48.00	487000	3618700	4.092E-06	3775	1115	0.0154	0.0046	0.0007
49.00	487000	3617900	3.181E-06	3893	936	0.0124	0.0030	0.0004
50.00	486800	3617300	2.865E-06	1875	4081	0.0054	0.0117	0.0017
51.00	485500	3618400	4.787E-06	1773	7109	0.0085	0.0340	0.0049
52.00	485700	3619400	4.066E-06	2424	5082	0.0099	0.0207	0.0030
53.00	484800	3625300	2.380E-06	5561	39477	0.0132	0.0940	0.0135
54.00	484300	3618900	3.799E-06	1526	19343	0.0058	0.0735	0.0106
55.00	486300	3620400	3.931E-06	754	6160	0.0030	0.0242	0.0035
56.00	485000	3620100	3.752E-06	1964	5471	0.0074	0.0205	0.0030
57.00	484800	3620500	3.545E-06	1693	3062	0.0060	0.0109	0.0016
58.00	484200	3620500	3.648E-06	931	7002	0.0034	0.0255	0.0037
59.00	484600	3621000	3.295E-05	2598	2099	0.0086	0.0069	0.0010
60.00	484600	3621700	3.041E-06	3374	4895	0.0103	0.0149	0.0021
61.00	483700	3621700	3.235E-06	2388	1946	0.0077	0.0063	0.0009
62.00	482400	3621200	2.849E-06	30	13216	0.0001	0.0377	0.0054
63.00	481500	3622300	2.528E-06	4388	6628	0.0111	0.0168	0.0024

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
64.00	479800	3621300	3.027E-06	10957	15282	0.0332	0.0463	0.0067
65.00	481700	3623500	2.120E-06	2697	21005	0.0057	0.0445	0.0064
66.00	480800	3622700	2.371E-06	1669	2789	0.0040	0.0066	0.0010
68.00	470300	3623400	1.578E-06	7025	2519	0.0111	0.0040	0.0006
69.00	477000	3623300	2.062E-06	5240	1086	0.0108	0.0022	0.0003
70.01	478700	3621100	2.002E-06	4510	3136	0.0090	0.0063	0.0009
70.02	477800	3621400	1.769E-06	3092	423	0.0055	0.0007	0.0001
71.00	477500	3619600	2.887E-06	5376	3140	0.0155	0.0091	0.0013
72.00	475700	3646300	7.127E-07	5394	1167	0.0038	0.0008	0.0001
73.01	476500	3622300	1.650E-06	4869	274	0.0080	0.0005	0.0001
73.02	477100	3621700	1.803E-06	2116	207	0.0038	0.0004	0.0001
74.00	477700	3622800	2.340E-06	6190	670	0.0145	0.0016	0.0002
75.00	477000	3623200	1.991E-06	7092	2203	0.0141	0.0044	0.0006
76.00	477600	3626800	1.593E-06	7138	5428	0.0114	0.0086	0.0012
77.00	477800	3627800	1.580E-06	7073	612	0.0112	0.0010	0.0001
78.00	479100	3629600	1.671E-06	7174	3792	0.0120	0.0063	0.0009
79.01	476700	3628700	1.521E-06	4757	4057	0.0072	0.0062	0.0009
79.02	477700	3629000	1.290E-06	8992	3038	0.0116	0.0039	0.0006
80.01	476400	3629700	1.400E-06	6283	2154	0.0088	0.0030	0.0004
80.02	477600	3629900	1.295E-06	2522	186	0.0033	0.0002	0.0000
81.01	474300	3232700	2.252E-07	3861	2271	0.0009	0.0005	0.0001
81.02	474300	3631300	1.230E-06	3091	1092	0.0038	0.0013	0.0002
82.00	474600	3634000	9.495E-07	3642	11226	0.0035	0.0107	0.0015
83.01	478200	3630800	2.900E-06	3765	521	0.0109	0.0015	0.0002
83.03	476100	3633600	1.457E-06	3994	932	0.0058	0.0014	0.0002
83.05	478300	3637400	1.252E-06	6075	16369	0.0076	0.0205	0.0030
83.06	479000	3634200	1.437E-06	3839	270	0.0055	0.0004	0.0001
83.07	480500	3634700	1.311E-06	4205	924	0.0055	0.0012	0.0002
83.10	477000	3632000	1.567E-06	6878	667	0.0108	0.0010	0.0002
83.11	475500	3631700	1.247E-06	2900	238	0.0036	0.0003	0.0000
83.12	476600	3635300	1.236E-06	4519	7196	0.0056	0.0089	0.0013
83.13	477600	3635600	1.210E-06	2882	532	0.0035	0.0006	0.0001
83.14	481900	3635100	1.445E-06	7808	2141	0.0113	0.0031	0.0004
83.15	478300	3635700	1.332E-06	6271	2515	0.0084	0.0034	0.0005
83.16	479900	3633100	1.578E-06	13804	4767	0.0218	0.0075	0.0011
83.17	481000	3636900	1.323E-06	5760	29890	0.0076	0.0395	0.0057
83.18	485700	3640600	1.786E-06	8744	28563	0.0156	0.0510	0.0073
83.19	487800	3640900	2.201E-06	14813	7255	0.0326	0.0160	0.0023
83.20	487400	3642100	2.091E-06	9539	636	0.0199	0.0013	0.0002
83.21	488100	3643300	1.972E-06	14994	1467	0.0296	0.0029	0.0004
83.22	486000	3642100	1.774E-06	14035	6873	0.0224	0.0122	0.0018
83.23	487400	3646500	1.790E-06	33618	3583	0.0602	0.0064	0.0009
85.01	479600	3632500	1.526E-06	5717	2457	0.0087	0.0037	0.0005

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
85.02	480900	3633000	1.467E-06	6792	1609	0.0100	0.0024	0.0003
85.03	480000	3630800	1.581E-06	7444	4582	0.0118	0.0072	0.0010
85.04	481800	3631400	1.592E-06	6576	2060	0.0105	0.0033	0.0005
85.05	482700	3633100	1.600E-06	6049	1052	0.0097	0.0017	0.0002
85.06	482600	3632400	1.677E-06	4063	439	0.0068	0.0007	0.0001
85.07	483800	3631900	1.540E-06	7692	1609	0.0118	0.0025	0.0004
85.09	483900	3630500	1.797E-06	6976	1830	0.0125	0.0033	0.0005
85.10	484800	3629900	1.689E-06	6381	878	0.0108	0.0015	0.0002
85.11	486800	3631600	2.667E-06	1230	77127	0.0033	0.2057	0.0296
85.12	482600	3630000	1.751E-06	4458	404	0.0078	0.0007	0.0001
85.13	483100	3629400	1.878E-06	3125	551	0.0059	0.0010	0.0001
86.00	483600	3628100	2.058E-06	5611	1134	0.0115	0.0023	0.0003
87.01	484800	3628600	1.938E-06	3252	752	0.0063	0.0015	0.0002
87.02	485500	3628100	1.945E-06	5180	6450	0.0101	0.0125	0.0018
88.00	484500	3627100	2.391E-06	8210	691	0.0196	0.0017	0.0002
89.00	483900	3625900	2.427E-06	9255	16011	0.0225	0.0389	0.0056
90.00	483600	3626400	2.353E-06	3670	334	0.0086	0.0008	0.0001
91.01	480900	3628800	1.784E-06	6263	1225	0.0112	0.0022	0.0003
91.02	481700	3629400	1.983E-06	2664	789	0.0053	0.0016	0.0002
91.03	481600	3627500	1.966E-06	3868	1083	0.0076	0.0021	0.0003
91.04	481400	3626700	2.108E-06	3098	705	0.0065	0.0015	0.0002
91.05	481700	3625400	2.487E-06	6950	7264	0.0173	0.0181	0.0026
92.01	486400	3628800	2.600E-06	5745	1642	0.0149	0.0043	0.0006
92.02	486500	3627800	2.671E-06	4710	694	0.0126	0.0019	0.0003
93.01	487400	3628900	3.232E-06	4387	2796	0.0142	0.0090	0.0013
93.03	488200	3628500	3.765E-06	6077	2890	0.0229	0.0109	0.0016
93.04	486300	3626000	2.411E-06	6063	18079	0.0146	0.0436	0.0063
94.00	487900	3638700	2.412E-06	3034	11822	0.0073	0.0285	0.0041
95.01	489900	3630300	3.459E-06	15435	2348	0.0534	0.0081	0.0012
95.02	489900	3632500	3.000E-06	3774	646	0.0113	0.0019	0.0003
95.03	491500	3631700	2.703E-06	16023	1903	0.0433	0.0051	0.0007
95.04	493500	3640600	1.721E-06	3856	787	0.0066	0.0014	0.0002
96.02	491900	3628500	3.416E-06	4195	1489	0.0143	0.0051	0.0007
96.03	490200	3627200	4.256E-06	4227	5549	0.0180	0.0236	0.0034
96.04	491300	3627600	3.583E-06	3898	6288	0.0140	0.0225	0.0032
97.03	493000	3628400	2.833E-06	4034	450	0.0114	0.0013	0.0002
97.04	494600	3629700	2.215E-06	7274	830	0.0161	0.0018	0.0003
97.05	493400	3627400	2.862E-06	4026	323	0.0115	0.0009	0.0001
97.06	494600	3627800	2.646E-06	7631	1186	0.0202	0.0031	0.0005
98.01	497200	3628400	2.726E-06	4931	1239	0.0134	0.0034	0.0005
98.02	498500	3628400	2.626E-06	6550	1076	0.0172	0.0028	0.0004
98.04	498800	3629800	2.445E-06	6110	518	0.0149	0.0013	0.0002
98.05	495500	3630100	2.511E-06	4312	625	0.0108	0.0016	0.0002

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
99.01	477200	3617900	4.020E-06	1111	11290	0.0045	0.0454	0.0065
99.02	483100	3620200	3.513E-06	0	0	0.0000	0.0000	0.0000
100.01	494500	3605000	4.132E-05	3575	537	0.1477	0.0222	0.0032
100.02	494100	3604100	3.026E-05	9027	818	0.2732	0.0248	0.0036
100.03	495700	3604100	3.115E-05	5831	193	0.1816	0.0060	0.0009
100.04	494800	3603200	2.491E-05	4910	236	0.1223	0.0059	0.0008
100.05	495100	3602300	2.068E-05	7452	1528	0.1541	0.0316	0.0046
100.06	494900	3601100	1.683E-05	10837	2354	0.1824	0.0396	0.0057
100.07	496300	3600900	1.655E-05	11014	9814	0.1822	0.1624	0.0234
101.03	490800	3605800	7.293E-05	4266	744	0.3111	0.0543	0.0078
101.04	490700	3602800	3.872E-05	3529	60	0.1366	0.0023	0.0003
101.05	492100	3602700	3.073E-05	13854	899	0.4257	0.0276	0.0040
101.06	493100	3602800	2.732E-05	6426	1537	0.1756	0.0420	0.0060
101.07	492400	3604700	4.377E-05	5175	682	0.2265	0.0299	0.0043
102.00	488300	3603500	1.671E-05	7883	1331	0.1317	0.0222	0.0032
103.00	489100	3603800	2.490E-05	4653	303	0.1159	0.0075	0.0011
104.00	489800	3603800	2.555E-05	7166	312	0.1831	0.0080	0.0011
105.00	488800	3605000	2.319E-05	6539	1865	0.1516	0.0432	0.0062
106.01	487300	3609200	2.184E-05	1696	449	0.0370	0.0098	0.0014
106.02	484800	3614900	6.853E-06	2085	2966	0.0143	0.0203	0.0029
106.03	483600	3615100	7.132E-06	929	205	0.0066	0.0015	0.0002
107.00	482900	3616000	5.989E-06	1302	3629	0.0078	0.0217	0.0031
108.00	482800	3616700	4.368E-06	3129	846	0.0137	0.0037	0.0005
109.00	483600	3616200	4.639E-06	1912	482	0.0089	0.0022	0.0003
110.00	484000	3617100	5.589E-06	2648	1407	0.0148	0.0079	0.0011
111.00	483200	3617500	5.440E-06	4136	377	0.0225	0.0021	0.0003
112.00	482200	3617000	4.381E-06	1198	56	0.0052	0.0002	0.0000
113.00	481100	3617900	3.798E-06	6701	33555	0.0255	0.1274	0.0184
114.00	489200	3614700	1.356E-05	12268	15190	0.1663	0.2060	0.0297
115.00	489700	3612900	2.710E-05	315	6798	0.0085	0.1842	0.0265
116.00	490900	3613500	3.448E-05	7462	1930	0.2573	0.0665	0.0096
117.00	490800	3614700	2.400E-05	5211	4344	0.1251	0.1043	0.0150
118.00	490800	3615600	1.873E-05	8371	1076	0.1568	0.0202	0.0029
119.00	492000	3616400	1.052E-05	6285	1997	0.0661	0.0210	0.0030
120.00	492500	3615200	1.566E-05	7591	1201	0.1189	0.0188	0.0027
121.00	492000	3614200	2.216E-05	4738	800	0.1050	0.0177	0.0026
122.00	493000	3613600	1.992E-05	3185	784	0.0634	0.0156	0.0022
123.01	493000	3611800	3.512E-05	5655	1202	0.1986	0.0422	0.0061
123.02	492300	3611100	6.380E-05	1025	1526	0.0654	0.0974	0.0140
124.01	491500	3612300	5.116E-05	2498	1985	0.1278	0.1016	0.0146
124.02	491600	3611300	8.414E-05	3866	1811	0.3253	0.1524	0.0219
125.00	489700	3610900	7.090E-05	6090	3137	0.4318	0.2224	0.0320
126.00	491100	3609000	3.579E-04	4121	6277	1.4749	2.2465	0.3235

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
127.00	491300	3610300	2.964E-04	3747	4283	1.1105	1.2694	0.1828
128.00	493200	3610600	4.292E-05	3218	386	0.1381	0.0166	0.0024
129.00	493400	3609500	6.909E-05	2884	952	0.1993	0.0658	0.0095
130.00	491900	3609300	4.280E-04	4399	2676	1.8829	1.1454	0.1649
131.01	491300	3607700	1.726E-04	4638	3679	0.8005	0.6349	0.0914
131.02	493600	3608300	1.255E-04	4987	1385	0.6261	0.2367	0.0341
132.01	492400	3606300	6.150E-05	5405	3899	0.3324	0.2398	0.0345
132.02	493700	3606600	7.239E-05	6873	2226	0.4975	0.1611	0.0232
133.01	495000	3609200	3.821E-05	4498	287	0.1719	0.0110	0.0016
133.02	495300	3608200	5.484E-05	4352	191	0.2387	0.0105	0.0015
133.03	495100	3607300	7.034E-05	4432	551	0.3117	0.0388	0.0056
133.04	495200	3606300	6.522E-05	9688	1287	0.6318	0.0839	0.0121
133.05	496800	3607500	3.580E-05	11963	2549	0.4282	0.0912	0.0131
134.01	494300	3610300	2.679E-05	4257	859	0.1141	0.0230	0.0033
134.03	499100	3611200	7.241E-06	22277	4142	0.1613	0.0300	0.0043
134.04	499100	3613600	6.012E-06	24475	1102	0.1472	0.0066	0.0010
135.01	501800	3621500	2.992E-06	9042	2013	0.0271	0.0066	0.0009
135.02	503000	3621500	3.320E-06	8109	2382	0.0259	0.0079	0.0011
136.01	502100	3623500	2.385E-06	6146	1045	0.0147	0.0025	0.0004
136.02	505400	3623500	2.698E-06	12532	2893	0.0338	0.0078	0.0011
137.00	500400	3622200	2.969E-06	6480	2019	0.0192	0.0060	0.0009
138.00	498900	3631500	2.249E-06	6406	1272	0.0144	0.0029	0.0004
139.01	499100	3620200	3.617E-06	8997	1160	0.0325	0.0042	0.0006
139.02	500300	3618900	4.621E-06	10274	1659	0.0475	0.0077	0.0011
139.03	499700	3618100	5.154E-06	4150	997	0.0214	0.0051	0.0007
140.01	497500	3621700	3.575E-06	4836	977	0.0173	0.0035	0.0005
140.02	498100	3620400	4.617E-06	4195	966	0.0194	0.0045	0.0006
141.00	496500	3619800	4.628E-06	6783	444	0.0314	0.0021	0.0003
142.00	495900	3620600	4.637E-06	6417	1339	0.0298	0.0062	0.0009
143.00	496100	3621700	4.396E-06	2929	138	0.0129	0.0006	0.0001
144.00	496900	3622400	3.640E-06	3325	4826	0.0121	0.0176	0.0025
145.00	495700	3623300	4.232E-06	3388	391	0.0143	0.0017	0.0002
146.00	497400	3624200	3.243E-06	8746	4493	0.0284	0.0146	0.0021
147.00	496000	3624600	3.723E-06	7050	1449	0.0262	0.0054	0.0008
148.01	495800	3626100	3.318E-06	6732	3748	0.0223	0.0124	0.0018
148.03	497700	3626400	3.045E-06	4620	4134	0.0141	0.0126	0.0018
148.04	497100	3627400	2.958E-06	4672	783	0.0138	0.0023	0.0003
149.00	498800	3625000	2.614E-06	6738	4554	0.0176	0.0119	0.0017
150.00	499100	3627000	2.386E-06	5588	7218	0.0133	0.0172	0.0025
151.00	500300	3627600	2.078E-06	4421	758	0.0092	0.0016	0.0002
152.00	500900	3625500	2.877E-06	4187	1039	0.0120	0.0030	0.0004
153.01	503900	3627100	1.970E-06	2679	251	0.0053	0.0005	0.0001
153.02	502700	3625900	2.254E-06	4140	551	0.0093	0.0012	0.0002

Table 4 cont.

Census Tract	Centroid Coordinates		Cancer Risk	Population		Cancer Burden		
	X (m)	Y (m)		Residential	Occupational	Residential	Occupational	Adj. Occ. *
154.02	507500	3626200	2.104E-06	8880	371	0.0187	0.0008	0.0001
154.03	504800	3625300	1.962E-06	4573	349	0.0090	0.0007	0.0001
154.04	505700	3626500	1.761E-06	6761	719	0.0119	0.0013	0.0002
155.00	513600	3632000	1.445E-06	8639	1358	0.0125	0.0020	0.0003
156.01	506700	3627900	1.573E-06	5240	740	0.0082	0.0012	0.0002
156.02	508400	3627900	1.732E-06	3107	1219	0.0054	0.0021	0.0003
157.01	505400	3628400	1.711E-06	4093	1447	0.0070	0.0025	0.0004
157.02	505400	3627800	1.706E-06	7913	1901	0.0135	0.0032	0.0005
158.00	503600	3627900	2.142E-06	6202	5849	0.0133	0.0125	0.0018
159.00	502800	3627100	2.379E-06	7005	1325	0.0167	0.0032	0.0005
160.00	501800	3627400	2.408E-06	2406	4460	0.0058	0.0107	0.0015
161.00	500900	3628800	1.914E-06	5951	1130	0.0114	0.0022	0.0003
162.01	500900	3629300	1.905E-06	7141	3129	0.0136	0.0060	0.0009
162.02	502700	3630200	1.776E-06	3097	20921	0.0055	0.0372	0.0054
163.00	504800	3629100	1.850E-06	8107	2711	0.0150	0.0050	0.0007
164.01	506800	3630300	1.521E-06	7106	2315	0.0108	0.0035	0.0005
164.02	507500	3629100	1.448E-06	5612	1773	0.0081	0.0026	0.0004
165.01	504200	3631100	1.892E-06	7271	1998	0.0138	0.0038	0.0005
165.02	505300	3630400	1.833E-06	4767	1308	0.0087	0.0024	0.0003
166.02	501500	3632700	1.693E-06	7011	6072	0.0119	0.0103	0.0015
166.03	501500	3634000	1.726E-06	7937	1937	0.0137	0.0033	0.0005
166.05	498600	3631900	2.183E-06	6505	1273	0.0142	0.0028	0.0004
166.06	498300	3633500	1.986E-06	4116	387	0.0082	0.0008	0.0001
166.07	503300	3634700	1.421E-06	8105	3804	0.0115	0.0054	0.0008
166.08	503300	3635900	1.381E-06	3350	153	0.0046	0.0002	0.0000
166.09	502200	3636300	1.594E-06	6375	262	0.0102	0.0004	0.0001
166.10	502100	3635400	1.609E-06	3671	222	0.0059	0.0004	0.0001
166.11	499700	3634800	1.862E-06	10633	544	0.0198	0.0010	0.0001
167.01	504500	3632800	1.574E-06	7419	1180	0.0117	0.0019	0.0003
167.02	505700	3633700	1.611E-06	5234	1831	0.0084	0.0029	0.0004
168.02	513600	3635700	9.875E-07	5278	739	0.0052	0.0007	0.0001
168.03	507400	3632700	5.460E-06	9883	1227	0.0540	0.0067	0.0010
168.04	508100	3635400	5.625E-06	5769	1702	0.0325	0.0096	0.0014
168.05	509000	3633700	4.794E-06	9848	868	0.0472	0.0042	0.0006
169.00	505700	3637500	4.297E-06	9471	2337	0.0407	0.0100	0.0014
170.11	496100	3645800	4.261E-06	6283	5063	0.0268	0.0216	0.0031
170.12	492000	3641400	7.433E-06	25263	12082	0.1878	0.0898	0.0129
170.13	493600	3651300	5.205E-06	25631	4009	0.1334	0.0209	0.0030
170.17	490000	3649200	6.193E-06	30455	12859	0.1886	0.0796	0.0115
213.00	510000	3621000	7.482E-06	10388	2225	0.0777	0.0166	0.0024
TOTALS:				1780514	978378	19.3420	10.7189	1.5435

* Note: Adj. Occ. indicates occupational population cancer burden that has been adjusted with worker adjustment factor (0.144).

APPENDIX A-1: RISK ESTIMATES

1. Model all emission points at 1 gram/second emission rate. This yields the "relative concentration."
2. For example, the modeled benzene concentration at the maximum impact point is $5.840\text{E-}03 \text{ ug/m}^3$ ($6.483\text{E-}04 \text{ ug/m}^3$ from run A and $5.192\text{E-}03 \text{ ug/m}^3$ from run B).
3. Multiply the device and chemical-specific concentration by the unit risk factor (multiply the concentration by 0.144 for worker areas). For example, the unit risk for benzene is $2.9\text{E-}05 \text{ m}^3/\text{ug}$; then for the maximum exposed residence:

$$5.840\text{E-}04 \text{ ug/m}^3 \times 2.9\text{E-}05 \text{ m}^3/\text{ug} = 1.694\text{E-}07$$

4. Sum each device and chemical specific risk to get a total risk.

APPENDIX A-2: HAZARD INDEX ESTIMATES

1. Determine the maximum concentration for each device-chemical combination as shown in risk estimate calculation (Appendix A-1). For acute exposure, use hourly concentrations. For chronic use annual average.
2. Divide the calculated concentration by the acceptable exposure level. This is the hazard index.
3. For example, for benzene emissions, the calculated concentration (annual average) is $5.840\text{E-}03 \text{ ug/m}^3$; the chronic acceptable inhalation level is 71 ug/m^3 ; the chronic hazard index is:

$$\frac{5.840\text{E-}03 \text{ ug/m}^3}{71 \text{ ug/m}^3} = 8.225\text{E-}05$$

4. Add together all hazard indices that impact the same target organs or systems.
5. For the chronic hazard index, a worker exposure adjustment factor of 0.144 is used.

APPENDIX A-3: EXPOSED POPULATION ESTIMATES

1. Determine location and population for each centroid (data provided by APCD).
2. Determine maximum potential cancer risk for receptor at centroid location by running dispersion and ACE 2588 models.
3. Multiply the number of persons (represented by centroid location) by the maximum potential risk found at that centroid receptor location. For occupational cancer burden, multiply the risk by a factor of 0.144.

Example, receptor 1 = census tract 110 (484000,3617100)

- a) Residential Population = 2468
Maximum cancer risk = 8.393E-06
Cancer Burden: $2468 \times 8.393\text{E-}06 = 2.222\text{E-}02$
- b) Occupational Population = 1407
Maximum cancer risk = 8.393E-06
Cancer Burden: $1407 \times 8.393\text{E-}06 \times 0.144 = 1.700\text{E-}03$

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